R E P O R T R E S U M E S

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INSTRUCTIONAL PROGRAMMING PROCEDURES, APPENDIX.

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THE APPENDIX TO THE COURSE ON INSTRUCTIONAL PROGRAMING PROCEDURES (ED 003 814, ED 003 815) CONTAINS A NUMBER OF PAPERS FOR STUDENTS TO USE IN WRITING SUMMARY STATEMENTS OF CERTAIN RULES AND TECHNIQUES. IN ADDITION, THE APPENDIX CONTAINS SEVERAL CHECKLISTS AND "DECISION FLOW CHARTS" WHICH ARE TO BE USED IN WRITING FRAMES AND SEQUENCES OF FRAMES. THE AUTHOR POINTS OUT THAT THE PROGRAM TEACHES THE STUDENT HOW TO USE EACH CHECKLIST AND GUIDE, AND THAT THE RULES OF PROCEDURE ARE TO BE WRITTEN ONLY AFTER THE PROGRAM HAS MADE THEM MEANINGFUL. (JC)

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APPENDIX

TO

INSTRUCTIONAL PROGRAMMING PROCEDURES

William A. Deterline

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STUDENT NAME

APPENDIX

~~to~~

INSTRUCTIONAL PROGRAMMING PROCEDURES / APPENDIX

General Instructions:

This APPENDIX contains a number of pages or which you will write summary statements of certain rules and techniques that will be of use to you.

When you have completed the entire program this APPENDIX will be your own set of notes to keep and use. You will find it far easier to refer to the APPENDIX than to refer directly back to the program when you want to review or look up some specific procedure or technique. In addition, you will find that this APPENDIX contains several checklists and "decision flow charts" that you will learn to use in later units of this program as you learn to write your own frames and sequences of frames. Notice that the program teaches you how to use each checklist and guide, and note also that the rules and descriptions of procedures are to be written by you only after the program has made them meaningful to you.

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PROCEDURES FOLLOWED IN WRITING OBJECTIVES:

1. First Step:

2. Second Step:

3, Third Step:

4. Fourth Step:

5. Fifth Step:

STEP ONE: Broad Statement of Objectives.

"Student must be able to draw the M-D pyramid, put the letters of multiplication and division examples (equations of the form, A = BC, and X = Y/Z) correctly into the pyramid, and then use the pyramid as a guide to write all equations represented by the arrangement of letters in the pyramid".

STEP TWO: Criterion Test Questions.

The criterion test must include at least one question for each separate objective of the program. This test is to be used during the tryout and revision of the program. The test must pinpoint every weakness of the program, and can do this only if it is detailed and allows the programmer to identify each response that has apparently not been adequately taught by the program. In this way, the programmer can identify the weaknesses and revise the program to eliminate them.

(1) Draw an M-D pyramid.

(2) Write a multiplication example.

(3) Write a division example.

(4) Draw an M-D pyramid and put this multiplication example into it: J = KT.

(5) Draw an M-D pyramid and put this division example into it: P = D/G.

(6) What does one letter over another mean
a) in a division example?
b) in an M-D pyramid?

(7) Draw an M-D pyramid. Put M into the top block, F into the bottom left hand block, and P into the bottom right hand block. Write the multiplication example represented by the pyramid.

(8) Use the same pyramid you used in question (6). Write the division example, F = ?.

(9) Use the same pyramid you used in questions (6) and (7). Write the other division example.

ACCEPTABLE ANSWERS:

(1)

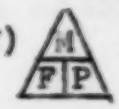
(2) H = DF

(3) L = V/P

(4)

(5)

(6) One letter over another means the top letter is to be divided by the bottom letter.

(7) 

M = FP

(8) F = M/P

(9) P = M/F

STEP THREE: Narrative Explanation

The narrative explanation must answer all questions in the criterion test, or explain how the student should answer them. Although a narrative explanation is an invaluable aid to the programmer, it is not always necessary to write one if a good textbook, reference manual, or detailed set of lesson plans is available to serve as the narrative explanation. It is important, however, that the programmer have this sort of material available rather than attempting to rely on his own memory for the content, examples, explanatory content and development, and so on.

Sample Narrative: The M-D Pyramid and It's Use.

An equation of the form, A = BC, or X = Y/Z, typically causes the student difficulaty when he is asked to write the equivalent equation showing a different one of the letters on the left side of the equal sign. A simple method of doing this uses a triangle or pyramid divided into three blocks, one above the other.

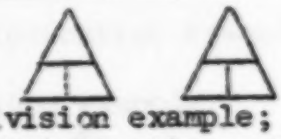
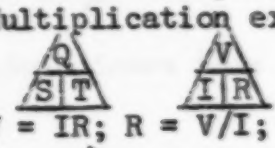
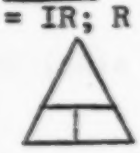
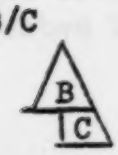
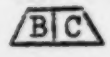
The two bottom blocks represent multiplication, and the vertical relationships represent division; that is, the top block may be divided by either of the two lower blocks but cannot be multiplied by either of them. Take the example, 6 = (3) (2). The 6 goes into the top block, and the 3 and the 2 go into the two bottom blocks. Note the vertical relationships: if we write 6/3, the remaining unused letter goes on the left of the equal sign - 2 = 6/3. Similarly, 3 = 6/2. Multiplication is represented by the two bottom blocks, 6 = (3) (2). It should be pointed out in the program that the two bottom blocks are side by side and represent multiplication, while the relationship between the top block and either bottom block is one above the other, just like the division representation 6/3.

Putting the letters into the blocks is quite simple. If the letters on the right of the equal sign are side by side, they go into the two blocks that are side by side, and represent multiplication. If the two letters on the right of the equal sign are one above the other, they go into two blocks that are one above the other, representing division. In either case, the letter on the left of the equal sign is put into the remaining unused block.

To write equations from the pyramid, the letter that is to go to the left of the equal sign is removed first and written down followed by an equal sign. The vertical or horizontal (side by side) relationship of the two remaining letters in the pyramid shows the relationship of those two letters on the right of the equal sign.

STEP FOUR: S-R Table.

SAMPLE S-R TABLE FOR M-D PYRAMID SEQUENCE (Student Sequence)

I = V/R; V = ?; R = ?	1. 
Q = ST; S = ?; T = ?	2. Division example; Multiplication example
	3. 
	4. V = IR; R = V/I; S = Q/T; T = Q/S
Draw an M-D pyramid.	
A = BC What kind of an example is this?	Multiplication example.
B = C/A What kind of an example is this?	Division example.
A = B/C Put this example in an M-D pyramid.	(Put A into the bottom left block. Put B into top block, and C into remain-block)
J = HK (any letters) Put this example into an M-D pyramid.	(Put J into the top block and H and K into the bottom blocks.)
Write a multiplication example from this pyramid.	Q = LT (Put the top letter on the left of the =, bottom two to the right.)
Write a division example from this pyramid.	Y = K/P (Take out one bottom letter, put it to left of =, other two remain to right, one over the other.
SUPPORTING S-R PAIRS	
Write a multiplication example.	T = LQ (or other letters) (4)
Write a division example.	J = R/S (or other letters) (4)
B/C 	B is to be divided by C. (3 and 4)
BC,	B is to be divided by C. (3 and 4)  (3)

NOTE: In this form, the table contains the basic set of S-R pairs, and the top part of the table shows the sequence the student must follow in using the pyramid. The teaching sequence is not represented by the arrangement in this table.

TEACHING SEQUENCE FOR S-R PAIRS FROM PYRAMID S-R TABLE.

STIMULUS	RESPONSE
X = YZ	Multiplication example.
A = B/C (A = $\frac{B}{C}$	Division example.
Draw M-D pyramid.	(Student draws this figure:)
Write multiplication example.	A = BC (this form, any letters)
These blocks of pyramid mean multiply . From multiplication example put letters that mean multiplication into these two blocks.(e.g. A = BC)	
Given pyramid and multiplication example, D = EF, put E & F into correct blocks, put remaining letter into remaining block.	
What multiplication example is represented by this pyramid?	G = HJ
Write division example.	A = B/C (A = $\frac{B}{C}$)
$\frac{X}{Y}$	X over Y
Given pyramid and division example, put letters into appropriate blocks of pyramid. $Z = \frac{X}{Y}$	
Given pyramid with letters in each block, write the multiplication example and two division examples represented by the pyramid.	R = ST S = R/T T = R/S
Criterion frame.	Correctly completes procedure.

CLASSIFICATION OF OBJECTIVES

1.

2.

3.

4.

5.

Note concerning the classification of objectives:

RULES AND PROCEDURES, PART I

Rule Number One:

Rule Number Two:

Rule Number Three:

Rule Number Four:

Rule Number Five:

Discussion of Rules Four and Five:

Rule Number Six:

EXPLANATION OF RULES ONE THROUGH FOUR

Rule Number One, explanation:

Rule Number Two, explanation:

Rule Number Three, explanation:

Rule Number Four, explanation:

TYPES OF EXISTING ASSOCIATIONS USED IN CUE FRAMES

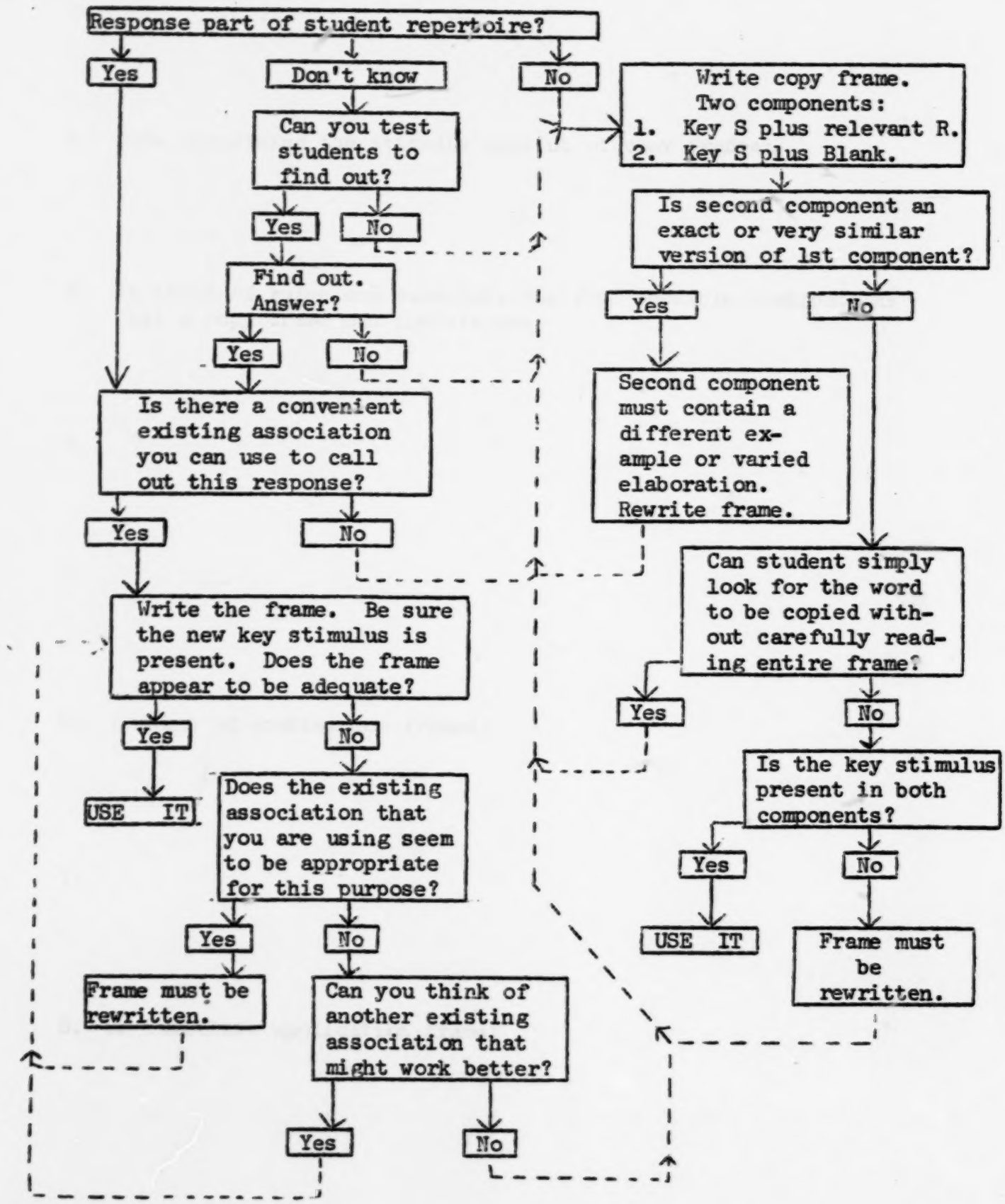
1.

2.

3.

4.

PREPARATION OF CUE FRAME OR COPY FRAME


Response part of student repertoire?
Yes
Don't know
No
Write copy frame.
Two components:
1. Key S plus relevant R.
2. Key S plus Blank.
Can you test students to find out?
Yes
No
Find out. Answer?
Yes
No
Is second component an exact or very similar version of 1st component?
Yes
No
Is there a convenient existing association you can use to call out this response?
Yes
No
Second component must contain a different example or varied elaboration. Rewrite frame.
Write the frame. Be sure the new key stimulus is present. Does the frame appear to be adequate?
Yes
No
Can student simply look for the word to be copied without carefully reading entire frame?
Yes
No
USE IT
Does the existing association that you are using seem to be appropriate for this purpose?
Yes
No
Is the key stimulus present in both components?
Yes
No
Frame must be rewritten.
Can you think of another existing association that might work better?
USE IT
Frame must be rewritten.
Yes
No

FRAME WRITING CHECK LIST

1. Content of copy frames:

2. Note concerning the stimulus content of copy frames:

3. In terms of rules and examples, the four possible combinations that a copy frame can contain are:

4.

5.

6. Content of combination frames:

7.

8. An immediate application frame:

ADAPTIVE SEQUENCING

We generally recognize three kinds of adaptive sequencing. Describe each.

1. BY-PASS:

2. BRANCHING:

3. WASHBACK:

QUESTION:

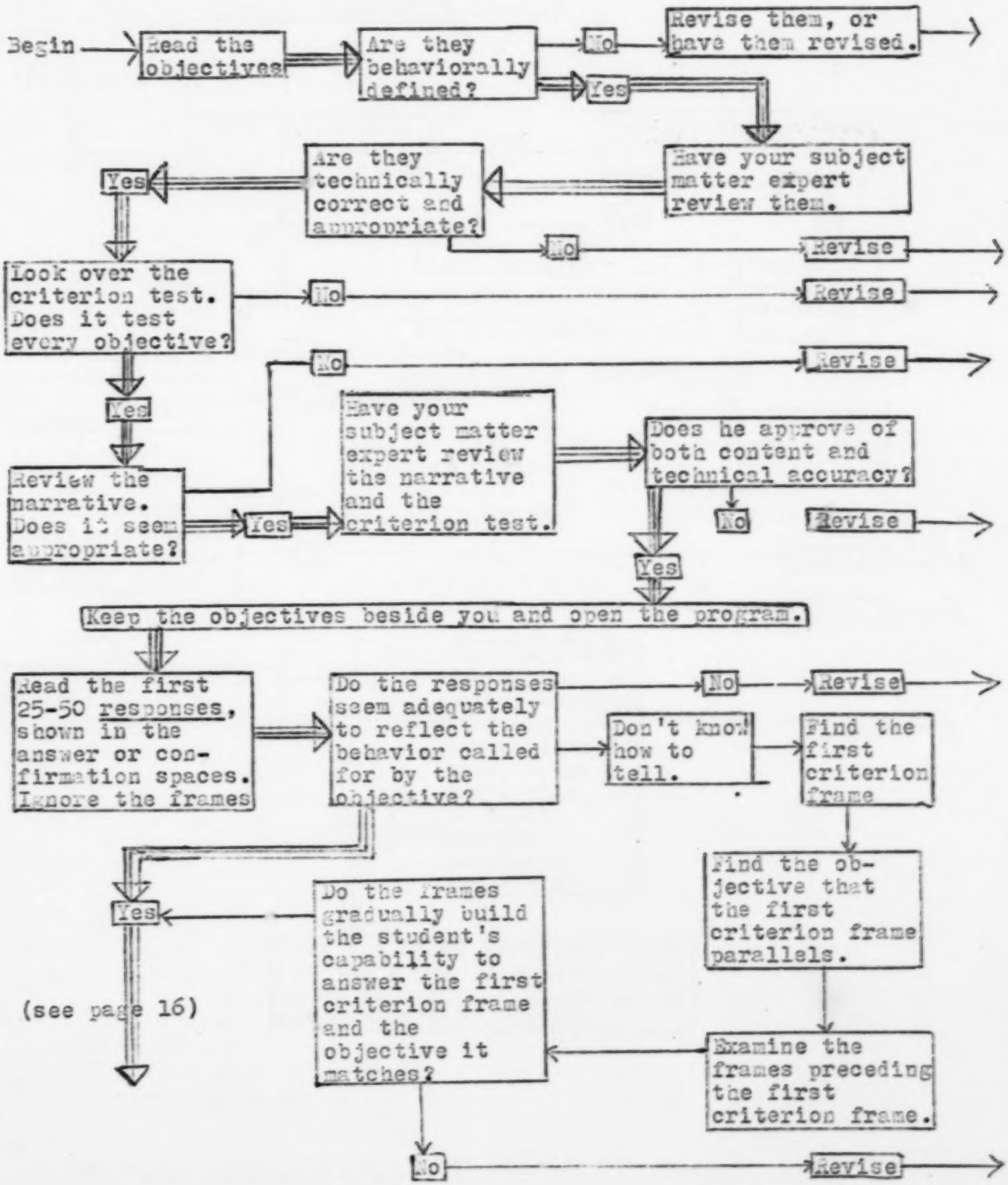
DISC and PERF Sequences

Discrimination Sequences:

Sample frames:

Performance Sequences (non-verbal):

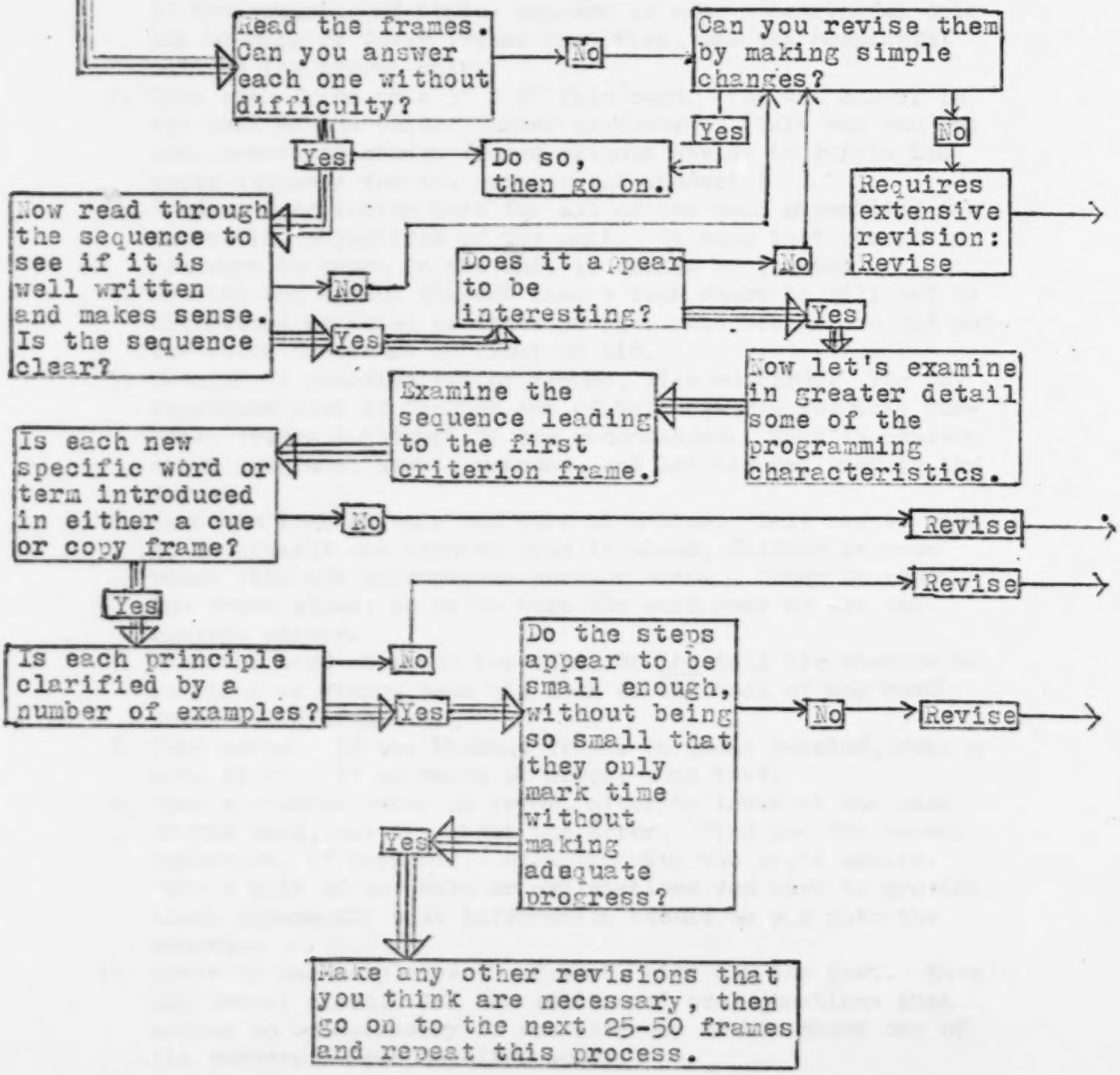
EDITING CHECK LIST


Begin
Read the objectives
Are they behaviorally defined?
No
Revise them, or have them revised.
Yes
Have your subject matter expert review them.
Are they technically correct and appropriate?
Yes
No
Revise
Look over the criterion test. Does it test every objective?
No
Revise
Yes
No
Revise
Review the narrative. Does it seem appropriate?
Yes
Have your subject matter expert review the narrative and the criterion test.
Does he approve of both content and technical accuracy?
No
Revise
Yes
Keep the objectives beside you and open the program.
Read the first 25-50 responses, shown in the answer or confirmation spaces. Ignore the frames
Do the responses seem adequately to reflect the behavior called for by the objective?
No
Revise
Don't know how to tell.
Find the first criterion frame
Find the objective that the first criterion frame parallels.
Examine the frames preceding the first criterion frame.
Yes
Do the frames gradually build the student's capability to answer the first criterion frame and the objective it matches?
No
Revise

(see page 16)

EDITING CHECK LIST (cont.)

(from page 15)


Read the frames. Can you answer each one without difficulty?
No
Can you revise them by making simple changes?
Yes
No
Yes
Do so, then go on.
Requires extensive revision: Revise
Now read through the sequence to see if it is well written and makes sense. Is the sequence clear?
No
Does it appear to be interesting?
No
Yes
Yes
Now let's examine in greater detail some of the programming characteristics.
Examine the sequence leading to the first criterion frame.
Is each new specific word or term introduced in either a cue or copy frame?
No
Revise
Revise
Yes
Is each principle clarified by a number of examples?
No
Yes
Do the steps appear to be small enough, without being so small that they only mark time without making adequate progress?
No
Revise
Yes
Make any other revisions that you think are necessary, then go on to the next 25-50 frames and repeat this process.

INDIVIDUAL PROGRAM TRYOUTS: CHECK LIST

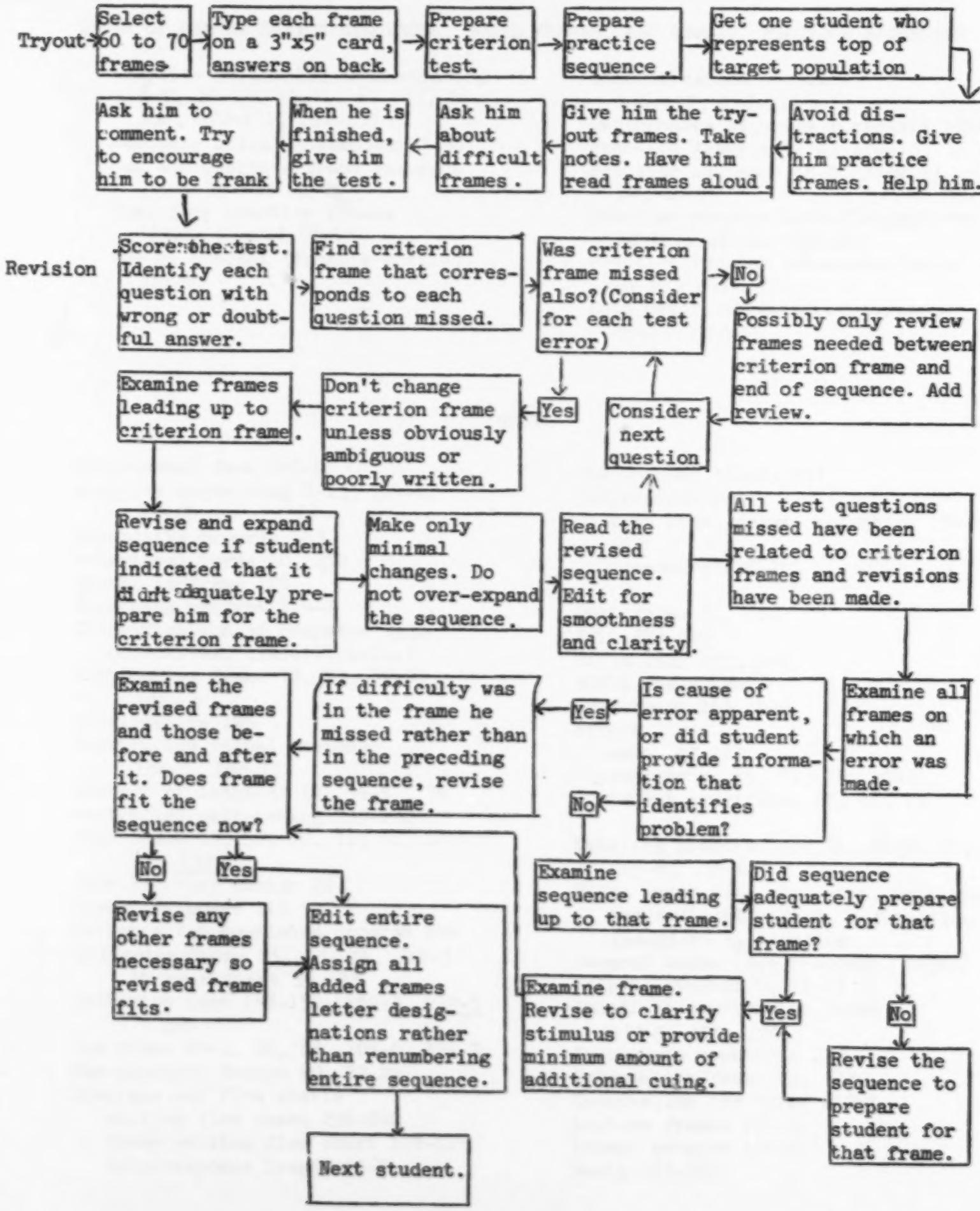
1. Test about 60 or 70 frames at a time. Select a set of about your first 60 or 70 frames, ending with a criterion frame. If the grouping of topics appears to make a meaningful unit out of more or fewer frames than that, use the meaningful unit as the tryout unit.
2. Type each frame on a 3" x 5" file card. Put the answer on the back of the card. Number each card. (This way you can add, remove or change frames without having to retype the whole sequence for the next tryout student.)
3. Prepare a criterion test for all of the main objectives and supporting objectives of the unit. Be sure that everything you want to teach in the unit is tested by the test.
4. Go with the tryout student into a room where he will not be distracted by noise or other people. Sit beside him and put the stack of frames in front of him.
5. Give him a practice set of frames, also on cards. You may reproduce part of Chapter one of this program for this purpose; frames 1 through 39 are recommended. They'll explain about programs, how to respond, and let him get used to the format.
6. Have him look at only one card at a time. Tell him to read it to himself and then to read it aloud, filling in each blank with the appropriate word or words. After he reads the frame aloud, he is to turn the card over to see the correct answer.
7. When the student reads the card, do <u>not</u> tell him whether he is right or wrong; make him look at the back of the card for that information.
8. Take notes. If the student frowns or looks puzzled, make a note of it. If he makes an error, note that.
9. When a student makes an error, after he looks at the back of the card, ask him about the error. Find out why he was incorrect, if possible. Help him with the right answer. Make a note of any help or explanations you have to provide, since apparently that information should be put into the program.
10. After he has completed the frames, give him the test. Have him answer aloud. Ask any additional oral questions that appear to be necessary if you have any doubts about any of his answers. Take detailed notes.
11. Ask him to comment on the frames, the test, or any characteristics that he liked or didn't like. Get as much information from him as you can.

REVISING ON THE BASIS OF INDIVIDUAL STUDENT TRYOUT: CHECK LIST

1. Ignore the notes about errors on frames for a moment. Look at the notes about how well he did on the criterion test questions.
2. If you were satisfied with his test answers, that means that the sequence seems to teach. Don't kid yourself, however, because you need to be pretty strict. If any question drew a doubtful answer, consider that answer completely wrong.
3. Consider each question he missed. Look back at the frames that were supposed to teach that answer. Did he answer the corresponding criterion frame correctly? If not, you must revise the sequence and we'll see how to do that in step 4. If the criterion frame was correct, you may have taught it but allowed the student to forget. In this case, the use of review frames similar to the criterion frame might do the job. Insert one about half way between that criterion frame and the end of the sequence, and add another review frame for that objective at the very end of the sequence. That may not be enough, but we'll find out from our next tryout student. Repeat this step for every criterion test item that he missed.
4. Now consider the objectives for which he missed both the test item and the related criterion frame. The notes you took should be of help here. Don't rewrite the criterion frame. Many novice programmers would simply rewrite the criterion frame, making it easier by adding a little cuing. Don't! Unless the student indicated that the criterion frame was ambiguous, leave it alone. If it was ambiguous, clarify it. Revise the sequence leading up to the criterion frame on the basis of your notes and the student's comments. Don't add too many frames, however. You might add another clarifying example in a practice frame or two. Don't go beserk, however, and expand the sequence unnecessarily. Just try to add a little more information and practice in an attempt to remove the deficiency. Do this for all criterion frames that were answered incorrectly.
5. Look at your notes for the number of all other frames that were missed. You may find a criterion frame that was missed even though he answered the corresponding items correctly on the criterion test. Try to find out how this happened and make any revisions you think are necessary.
6. Examine all other frames on which an error was made. Before you rewrite a frame, however, try to decide whether that frame was at fault, or the sequence leading up to it. If it looks as though the sequence did not prepare the student adequately for that frame, fix the sequence. If the frame itself seems to have been at fault, fix the frame. Be careful, however, and don't fix the frame by overcuing. You can always - inappropriately - eliminate an error by making the frame so simple that it accomplishes nothing. The extreme version of this would be a sequence of copy frames that did not ever put the student on his own!

7. Revise every frame on which an error was made except those that were apparently missed because of student carelessness. Remember the point made earlier: don't kid yourself, and don't try to blame the student for either carelessness or stupidity. In most cases an error on a frame was your fault, not his!
8. Re-read the whole sequence to see that your revisions didn't disrupt the smooth flow. Make any other revisions you feel are necessary.
9. If you have added any frames, don't renumber the whole set. If you inserted one frame after frame 5, call the inserted frame number 5a. If you inserted two frames after frame 10, call them 10a and 10b, etc., etc. Later, when the tryout and revision process is completed, you can renumber the whole set.

BASIC TRYOUT AND REVISION PROCEDURES


Tryout
Select 60 to 70 frames.
Type each frame on a 3"x5" card, answers on back.
Prepare criterion test.
Prepare practice sequence.
Get one student who represents top of target population.
Avoid distractions. Give him practice frames. Help him.
Give him the tryout frames. Take notes. Have him read frames aloud.
Ask him about difficult frames.
When he is finished, give him the test.
Ask him to comment. Try to encourage him to be frank
Revision
Score the test. Identify each question with wrong or doubtful answer.
Find criterion frame that corresponds to each question missed.
Was criterion frame missed also? (Consider for each test error)
No
Possibly only review frames needed between criterion frame and end of sequence. Add review.
Consider next question
Yes
Don't change criterion frame unless obviously ambiguous or poorly written.
Examine frames leading up to criterion frame.
Revise and expand sequence if student indicated that it did not adequately prepare him for the criterion frame.
Make only minimal changes. Do not over-expand the sequence.
Read the revised sequence. Edit for smoothness and clarity.
All test questions missed have been related to criterion frames and revisions have been made.
Examine all frames on which an error was made.
Is cause of error apparent, or did student provide information that identifies problem?
Yes
If difficulty was in the frame he missed rather than in the preceding sequence, revise the frame.
No
Examine sequence leading up to that frame.
Did sequence adequately prepare student for that frame?
Yes
Examine frame. Revise to clarify stimulus or provide minimum amount of additional cuing.
No
Revise the sequence to prepare student for that frame.
Examine the revised frames and those before and after it. Does frame fit the sequence now?
No
Revise any other frames necessary so revised frame fits.
Yes
Edit entire sequence. Assign all added frames letter designations rather than renumbering entire sequence.
Next student.

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